

CHAPTER 23

ERGONOMICS PROGRAM

2301. Background and Discussion

a. Ergonomics is the field of study that involves the application of knowledge about physiological, psychological and biomechanical capacities and limitations of the human body. This knowledge is applied in the planning, design, and evaluation of work environments, jobs, tools and equipment to enhance worker performance, safety and health. Ergonomics is essentially fitting the workplace to the worker.

b. This program seeks to prevent injuries and illnesses by applying ergonomic principles to identify, evaluate and control ergonomic risk factors for work-related musculoskeletal disorders (WMSDs). WMSDs are defined as a class of disorders involving damage to muscles, tendons, tendon sheaths, and related bones, muscles, and nerves. They may also be known more specifically as repetitive strain injuries (RSI); Cumulative Trauma Disorders (CTDs) and Over-use Syndrome. WMSDs result from the cumulative effect of repeated traumas associated with specific workplace risk factors. Ergonomic risk factors include but are not limited to:

(1) Physical or biomechanical stress induced by excessive movement such as prolonged typing, assembling components, and repeated hand tool usage.

(2) Sustained positions such as standing or holding a body part away from the body for long periods.

(3) Awkward or unsupported postures such as working with the back bent forward, kneeling, or stooping.

(4) Excessive vibration from powered hand tools, vehicles, or other equipment.

(5) Exertions associated with force caused by frequent or heavy lifting, pushing, grasping, pulling, or carrying of heavy or cumbersome objects.

(6) Compression or contact stress caused by resting against the edge of a work surface or grasping sharp edges like hand tools.

(7) Physiological stress induced by heat, cold, use of personal protective equipment, shift work, extended work schedules; or excessive physical activity without adequate work breaks.

When present for sufficient duration, frequency, or magnitude, these risk factors may contribute to WMSDs. In addition, personal risk factors, such as, physical conditioning, existing health problems, gender, age, work technique, hobbies and organizational factors (e.g. job autonomy, quotas, deadlines) contribute to the development of WMSDs.

2302. Management Commitment

a. A successful ergonomic program cannot be implemented without commitment by the commanding officer, or officer in charge, to resource and support worker and staff efforts to control ergonomic risk factors and reduce associated injury. Aggressive, visible, and coordinated management actions are necessary to prevent WMSDs, control costs related to these injuries, and improve mission readiness.

2303. Employee Involvement

a. Employee involvement and feedback are essential to identify ergonomic hazards and develop an effective means for their abatement. A command ergonomic program shall include worker involvement to assist in ergonomic hazard identification.

(1) If the command has a safety and health committee, the committee shall review and analyze ergonomic problem areas and recommend corrective actions.

(2) The command may form worker-based teams to identify ergonomic problems, analyze risk factors, and develop solutions. Civilian best business practices reports and military studies have proven worker-based teams to be extremely effective in controlling ergonomic risk factors and reducing injury.

2304. Process Review and Measurement

a. Each activity shall include a self-assessment of its ergonomic program as part of the Process Review and Measurement System (PR&MS).

b. Each activity shall conduct a periodic analysis of WMSD reportable and recordable injury and illness data from OPNAV 5102/6 or an equivalent database or log. Refer to paragraph 1409 of this instruction for guidance on completing this form.

c. WMSD analyses should include specific departments, codes, or operations experiencing WMSDs to determine where there is greater risk for injury. An accurate trend analysis for WMSDs should also include, but is not limited to, the following:

(1) Body part involved

(2) Specific type of injury/illness (e.g.: BLS code, medical diagnosis)

(3) Number of known WMSD injuries and illnesses or determine rate of WMSD within a defined population

(4) Number of lost workdays due to WMSD injury and illness or determine rate within a defined population

(5) Description of job(s) to include ergonomic risk factors

(6) Cost of treatment (if known)

d. An activity should consider observations made during safety inspections and other factors, such as absenteeism, high personnel turnovers, fitness and age of workers in the identification of ergonomic risk factors. The command may also elect to survey personnel in occupations known or suspected to have high risks to determine if they have experienced unreported warning signs or injuries.

e. Additional measures and metrics to assess and monitor the ergonomic program may be developed by each activity as necessary to adequately conduct more detailed analyses.

2305. Job Task Analysis

a. Activities shall identify ergonomic risk factors as part of, or in conjunction with, workplace inspections required by chapter 9 and industrial hygiene surveys required by chapter 8. Risk factors to consider include awkward posture, sustained positions, excessive force, excessive repetition, contact stress, segmental or whole body vibration, unsafe bending, twisting, over-reaching, overhead work, excessive pinch gripping and overexertion.

b. Activities shall use appendix 23-A for the following situations:

(1). Analysis of a task or operation attributable to a WMSD.

(2.) Analysis of a task or operation identified as causing muscular pain or joint pain.

(3.) Analysis of a task or operation identified as causing numbness or tingling of any body part.

(4.) Analysis of a task or operation identified as causing extreme discomfort or muscular fatigue.

(5.) Analysis of repetitive motion tasks and operations considered significant by the activity.

(6.) As the initial analysis conducted by a worker-based team.

(7.) New analysis of jobs, tasks, operations, or workstations modified due to ergonomic concerns.

c. The activity shall review the identified risk factors in appendix 23-A and determine what action is required to eliminate the risk factor. There may be situations where action may not be deemed necessary after thorough analysis. If no action is taken, the risk factor analysis and decision rationale shall be documented in writing and kept on file for at least 5 years.

NOTE:

The Job Requirements and Physical Demands survey (JRPD) is an additional ergonomic tool that may be used by trained safety and occupational health personnel to identify jobs with ergonomic risk factors, employee discomfort, and assess ergonomic stressors. The JRPD may be used as a follow-up tool to Appendix 23-A or independ-

ently to quantify ergonomic risks and prioritize projects. JRPD information may be provided through the resource list in appendix 23-B.

d. Ergonomic assessments shall be assigned Risk Assessment Codes (RAC) consistent with chapters 9 and 12.

2306. Command Assistance

a. The principles and application of ergonomics is a multidisciplinary applied science encompassing medical, engineering, industrial hygiene, and safety fields. It is recognized that activity personnel may not have the experience necessary to identify, analyze and resolve all ergonomic situations. When the safety manager or other internally available staff identifies ergonomic issues beyond the scope of their capabilities, commands should seek assistance from the resource list in appendix 23-B.

2307. Hazard Prevention and Control

a. The preferred priorities for corrective actions of ergonomic risk factors include: ergonomic risk elimination, engineering controls, substitution of materials/tools/ equipment, improved work practices and administrative controls. Examples of administrative controls are: lifting restrictions, adjustment of work-rest cycles, slowing work pace, and job rotation.

b. Activities shall not use back support belts or wrist splints as safety protective equipment. These devices are considered medical appliances, and must be prescribed by a credentialed health care provider who shall assume responsibility for proper fit of the device, treatment, monitoring and supervision of the wearer.

c. Engineering Controls. Engineering controls are the preferred mechanism for controlling ergonomic risk factors. These controls may entail redesign of workstations, work methods, and tools to reduce or eliminate the risk factors. References 23-1 through 23-7 contain detailed guidance on principles and techniques for implementing engineering controls.

d. Workstation Design. Workstations should be easily adjustable to accommodate the person/persons performing a specific task or job, not just the average worker. Generally, design limits are based upon a range from the 5th percentile female to the 95th percentile male values for critical body dimensions. The work-space should be large enough to allow the full range of required movements. Anthropometric data and design recommendations for military equipment and facilities can be found in reference 23-2.

e. Illumination. This reference also includes design criteria for task illumination, vibration levels, noise levels and ventilation. Adequate illumination for highly visual tasks may be one of the primary concerns for some workstations. Both the quantity and the quality of light are important. Glare, contrast, and shadows influence lighting quality and can seriously diminish performance. Illumination design guidance may be found in reference 23-2. Existing illumination problems should be corrected using guidance from references 23-3 and 23-4 or other professional references that meet or exceed the references of this chapter.

f. Design of Work Methods. Analyses of work processes, that requires consideration of worker posture and repetition rate, should be supplemented by addressing the force or exertion

required of workers. Redesign of work methods should also consider any changes in the time required to perform tasks. WMSD reduction benefits may not be realized if ergonomic related steps are added to the process, but sufficient time is not allowed to perform such tasks.

g. Tool Design and Handles. Properly designed tools and handles increase worker productivity by extending and amplifying manipulative abilities and protecting the workers against concentrated forces. Activities shall pay proper attention to the selection and design of tools and workstation layouts to minimize WMSD risks and back injuries. Activities shall select or design tools and handles to minimize or eliminate the following risk factors for both male and female workers:

- (1.) High contact forces and static loading
- (2.) Extreme or awkward joint positions
- (3.) Repetitive action of the fingers, wrist and arm
- (4.) Tool vibration (see reference 23-10)
- (5) Excessive force or grip strength requirements.

NOTE:

Activities can accomplish many workstation and job procedure designs using an approach to ergonomics based on an understanding of human anatomy and physiology without resorting to time-consuming and expensive measurements. For example, activities should select hand tools to distribute the applied forces over a wide area of the hand regardless of the job being performed. Sometimes it is possible, on a small scale, to obtain sample tools from manufacturers for trial periods to allow employees and management decide which tool is the best based upon comfort, usability, utility, durability, price and productivity. This process will increase product acceptance and take advantage of worker experience and knowledge.

h. Administrative Controls. Activities shall only consider administrative controls after engineering controls or process redesign are not feasible. Administrative controls include:

- (1.) Rotating employees to jobs with dissimilar physical requirements.
- (2.) Establishing adequate work/ rest schedules.
- (3.) Where heavy objects must be handled, activities may calculate a recommended weight limit using the methods contained in references 23-2 and 23-7 to specify the maximum lift an unassisted individual should attempt for one or two handed lifts. The maximum lift an unassisted individual should attempt is 51 pounds under ideal lifting conditions.
- (4.) In situations where heavy lifts cannot be avoided, establish a policy to include the assistance of other personnel in the lift.
- (5.) Label the actual weight of any object that a worker needs to lift or carry.

(6.) Ensure that material in storage is stacked off the floor and placed at no less than knuckle height.

i. Planned Facility Modifications and Equipment Purchases. When activities develop plans for new or modified facilities, processes, jobs, tasks, materials and equipment, they shall analyze such plans for opportunities to eliminate or reduce ergonomic hazards. For example, when purchasing office furniture to equip new facilities or replace existing equipment, activities should consider selecting equipment that allows easy adjustment of chair height, keyboard position and video display screen position. Reference 23-2 provides further information on this topic.

j. Some projects developed to address ergonomic hazards that exceed the funding capability of local organizations may qualify for centrally-managed Navy occupational safety and health (NAVOSH) funds. Applications for these funds should be submitted per the procedures of chapter 12, Hazard Abatement Program.

2308. Ergonomic Training

a. A key to maintaining an effective ergonomics program is the proper training of managers, supervisors, professional staff, ergonomic teams and employees. General ergonomics training shall be provided to all employees as applicable to the employee's role in the workplace. Periodic refresher training should be provided at command discretion. Recommended training topics for various personnel are provided in appendix 23-C.

b. OSH professional staff responsible for conducting the ergonomics program shall receive formal training on the recognition and control of ergonomic risk factors in Navy work places. The Naval Occupational Safety and Health and Environmental Training Center (NAVOSH-ENVTRACEN) provides the Navy Ergonomics Program course (A-493-0085) to train OSH professional staff and other personnel involved in ergonomic assessments, control of ergonomic hazards, and program management.

2309. Medical Program

a. Cognizant medical commands shall support line activity initiatives to reduce WMSDs by providing occupational medicine services as described in section 0807. Occupational medicine professionals shall collaborate with commands, for the purpose of conducting work place visits to obtain knowledge of operations, work practices and transitional-duty jobs to provide ergonomics assessments, and facilitate recovery of individuals with WMSDs.

b. Physical Standards Pre-placement and Periodic Examinations. For positions that involve significant risk for WMSDs, the command, human relations office and cognizant medical command shall review the presence and adequacy of existing physical requirements of the job and make recommendations for improvement to the command.

NOTE:

As warranted, consistent with the provisions of 5CFR339.301 "an agency may require an individual who has applied for or occupies a position which has medical standards or

physical requirements or which is part of an established medical evaluation program, to report for a medical examination:

(1) Prior to appointment or selection (including reemployment on the basis of full or partial recovery from a medical condition);

(2) On a regularly recurring, periodic basis after appointment; or

(3) Whenever there is a direct question about an employee's continued capacity to meet the physical or medical requirements of a position.

(4) An agency may require an employee who has applied for or is receiving continuation of pay or compensation as a result of an on-the-job injury or disease to report for an examination to determine medical limitations that may affect placement decisions.”

c. Health Education for Ergonomic Hazards. Each cognizant medical command shall collaborate with and assist the employing command in providing health education and lifestyle modification information to individuals with WMSD symptoms and for all identified workers at high risk for WMSDs.

d. Recovery of Injured Employees. The Navy encourages cognizant medical commands to offer medical advice, counseling and physical therapy services to rehabilitate employees with WMSDs. Where such services are not available from the cognizant medical command, activities may contract for physical therapy services, provided the cognizant medical command has an opportunity to review the procurement specification prior to solicitation and provide professional medical oversight of the contract.

e. Monitoring for Trends. Health care professionals shall periodically, e.g., monthly, review occupationally related acute care visits to monitor WMSD trends.

2310. Responsibilities

a. Echelon Two Commands shall:

(1) Provide guidance and assistance as necessary to subordinate commands on program development and implementation.

(2) Coordinate program implementation among similar activity types; disseminate information on process improvements to eliminate duplication of effort.

b. Commander, Naval Supply Systems Command (COMNAVSUPSYSCOM) shall take appropriate actions to increase the availability of ergonomically-designed furnishings, equipment and tools through the supply system. Conversely, commands shall take efforts to purge the supply system of ergonomically incorrect equipment such as back belts.

c. Commander, Naval Facilities Engineering Command (COMNAVFACENGCOM) shall:

(1) Perform comprehensive ergonomic risk analysis of WMSD factors as part of the facility design process.

(2) Review plans for new or modified facilities, processes, jobs, tasks, tools, materials and equipment to ensure that changes will reduce or eliminate ergonomic risk factors for WMSDs.

(3) Develop and implement a Navy-wide program to minimize ergonomic stress through facility design, equipment selection and maintenance of facilities, equipment and tools.

d. Chief of Naval Education and Training (CNET) shall provide OSH ergonomics training consistent with requirements of this chapter.

e. Chief, Bureau of Medicine and Surgery (BUMED) shall:

(1) Develop technical and administrative guidance for the medical aspects of the ergonomics program.

(2) Provide medical support by developing therapy and treatment programs, including provision of physical therapists who perform in-house physical therapy to injured employees, serve as part of the education team providing training to prevent injuries and ergonomically evaluate return-to-work capabilities.

f. Commander, Naval Safety Center shall conduct a mishap analysis program, reviewing available data for a 5-year period, to identify WMSDs by activity and command, including number or rate of WMSD, injury/illness type, and body part.

g. Commanding Officers of Medical Commands, Activities, and Treatment Facilities shall:

(1) Monitor WMSD trends using appropriate records.

(2) Verify low risk of transitional duty assignments.

(3) Provide health education for personnel with a past history or current symptoms of WMSD and education on preventive measures for high-risk individuals.

(4) Assist line activities in the medical recovery of WMSD individuals and the implementation of transitional duty programs.

(5) Assist commands in the development of physical requirements for positions.

h. Commanders, Commanding Officers and Officers in Charge shall:

(1) Annually, analyze injury and illness records and other pertinent information to determine the need for ergonomic improvements and corrective actions within the activity.

(2) Identify and budget resources to administer an effective ergonomics program consistent with the guidance in this chapter.

(3) Consider shift-work related stressors when determining scheduling policies. Appendix 23-D provides guidance for shift work that does not involve military watch standing or military operational environments.

(4) Where rehabilitative services are not available from the cognizant medical command, activities may contract for such services, provided the cognizant medical command has an opportunity to review the procurement specification prior to solicitation and provide professional medical oversight of the contract.

Chapter 23

References

- 23-1. Department of Defense, Military Standard, Human Engineering Design Criteria for Military Systems, Equipment and Facilities, MIL-STD-1472F, 23 August 1999, (NOTAL)
- 23-2. Anthropometry of US Military Personnel, DOD-HDBK 743A, 13 Feb 1991.
- 23-3. Illuminating Engineering Society, IES Lighting Handbook, 9th ed., New York, 2000 (NOTAL)
- 23-4. American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IES) RP-7-1991, American National Standard Practice for Industrial Lighting (NOTAL)
- 23-5. American National Standards/ Human Factors Society (ANSI/HFS) 100-1998 American National Standard for Human Factors Engineering of Visual Display Terminal Workstations (NOTAL).
- 23-6. NIOSH Publication No. 97-117 of March 97, Elements of Ergonomics Programs – A Primer Based on Workplace Evaluations of Musculoskeletal Disorders (NOTAL)
- 23-7. National Institute for Occupational Safety and Health, A Work Practices Guide for Manual Lifting. Tech. Report No. 94-110 (1994), U.S. Department of Health and Human Services, Cincinnati, OH. (NOTAL)




Appendix 23-A

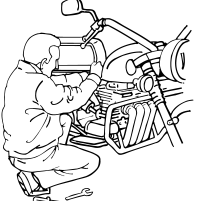

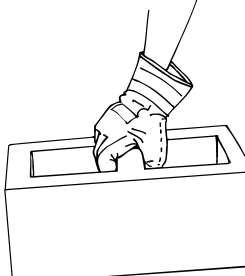
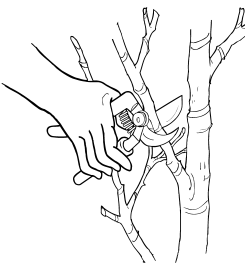


Ergonomic Survey Tool





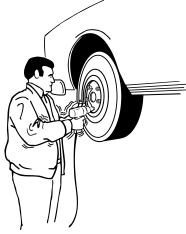

This checklist is an ergonomic screening tool for typical work activities. Typical work activities are a regular and foreseeable part of the job, occur more than 1 day per week and more frequently than 1 week per year. This checklist determines if a typical work activity has noteworthy ergonomic stressors present for sufficient duration. A 'caution zone' job is defined as having one or more boxes are checked in the checklist below.

A job found to be in the "caution zone" should be evaluated further by the command or through outside assistance. If possible, further analysis with the Job Requirements and Physical Demand (JRPD) survey is recommended. JRPD information may be obtained through the sources listed in appendix 23-B. Jobs not determined to be 'caution zone' should be periodically reevaluated since changes in the work environment may create new ergonomic stressors.

Checklist source: Washington State Department of Labor and Industries

Job Position Evaluated:	Date:	No. of employees in these jobs?	Employee Name	Reviewer Name
Caution Zone Checklist Use one sheet for each position evaluated.				
Movements or postures that are a regular and foreseeable part of the job, occurring more than one day per week, and more frequently than one week per year.		If done in this job position  the box		
Awkward Posture			Comments/Observations	
	1. Working with the hand(s) above the head, or the elbow(s) above the shoulders more than 2 hours total per day.			
	2. Working with the neck or back bent more than 30 degrees (without support and without the ability to vary posture) more than 2 hours total per day.			

	<p>3. Squatting more than 2 hours total per day.</p>	
	<p>4. Kneeling more than 2 hours total per day.</p>	
High Hand Force		Comments/Observations
	<p>5. Pinching an unsupported object(s) weighing 2 or more pounds per hand, or pinching with a force of 4 or more pounds per hand, more than 2 hours per day (comparable to pinching half a ream of paper).</p>	
	<p>6. Gripping an unsupported object(s) weighing 10 or more pounds per hand, or gripping with a force of 10 or more pounds per hand, more than 2 hours total per day (comparable to clamping light duty automotive jumper cables onto a battery).</p>	
Highly Repetitive Motion		Comments/Observations
	<p>7. Repeating the same motion with the neck, shoulders, elbows, wrists, or hands (excluding keying activities) with little or no variation every few seconds, more than 2 hours total per day.</p>	
	<p>8. Performing intensive keying more than 4 hours total per day.</p>	

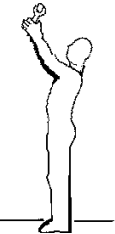
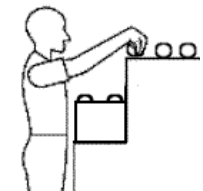

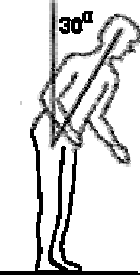

Repeated Impact		Comments/Observations
	9. Using the hand (heel/base of palm) or knee as a hammer more than 10 times per hour, more than 2 hours total per day.	
Heavy, Frequent or Awkward Lifting (A simple scale can be used to determine the weight of materials)		Comments/Observations
	10. Lifting object weighing more than 75 pounds once per day or more than 55 pounds more than 10 times per day.	
	11. Lifting objects weighing more than 10 pounds if done more than twice per minute, more than 2 hours total per day.	
	12. Lifting objects weighing more than 25 pounds above the shoulders, below the knees or at arms length more than 25 times per day.	
Moderate to High Hand-Arm Vibration (Closely estimate or obtain the vibration value of the tool in use)		Comments/Observations
	13. Using impact wrenches, carpet strippers, chain saws, percussive tools (jack hammers, scalers, riveting or chipping hammers) or other tools that typically have high vibration levels, more than 30 minutes total per day.	
	14. Using grinders, sanders, jigsaws or other hand tools that typically have moderate vibration levels more than 2 hours total per day.	

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For each "caution zone job" identified, find any physical risk factors that apply using the Follow-up checklist. Reading across the page, determine if all of the conditions are present in the work activities. If they are, a WMSD hazard exists and must be reduced below the hazard level or to the degree technologically and economically feasible

Follow-up Physical Risk Factor Check List

Awkward Posture			
Body Part	Physical Risk Factor	Duration	Visual Aid
Shoulders	Working with the hand(s) above the head or the elbow(s) above the shoulder(s)	More than 4 hours total per day	
	Repetitively raising the hand(s) above the head or the elbow(s) above the shoulder(s) more than once per minute	More than 4 hours total per day	
Neck	Working with the neck bent more than 45° (without support or the ability to vary posture)	More than 4 hours total per day	
Back	Working with the back bent forward more than 30° (without support, or the ability to vary posture)	More than 4 hours total per day	
	Working with the back bent forward more than 45° (without support or the ability to vary posture)	More than 2 hours total per day	

Check (✓) here if this is a WMSD hazard

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Awkward Posture (continued)			
Body Part	Physical Risk Factor	Duration	Visual Aid
Knees	Squatting	More than 4 hours total per day	
	Kneeling	More than 4 hours total per day	

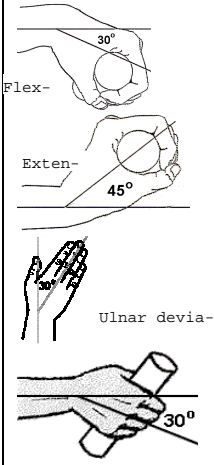
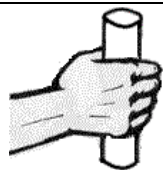
Check (✓) here if this is a WMSD hazard

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High Hand Force				
Body Part	Physical Risk Factor	Combined with	Duration	Visual Aid
Arms, wrists, hands	Pinching an unsupported object(s) weighing 2 or more pounds per hand, or pinching with a force of 4 or more pounds per hand (comparable to pinching half a ream of paper)	Highly repetitive motion	More than 3 hours total per day	
		Wrists bent in flexion 30° or more, or in extension 45° or more, or in ulnar deviation 30° or more	More than 3 hours total per day	
		No other risk factors	More than 4 hours total per day	

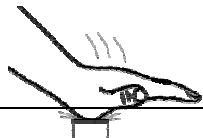
Check (✓) here if this is a WMSD hazard

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High Hand Forces				
Body Part	Physical Risk Factor	Combined with	Duration	Visual Aid
Arms, wrists, hands	Gripping an unsupported object(s) weighing 10 or more pounds per hand, or gripping with a force of 10 pounds or more per hand (comparable to clamping light duty automotive jumper cables onto a battery)	Highly repetitive motion	More than 3 hours total per day	
		Wrists bent in flexion 30° or more, or in extension 45° or more, or in ulnar deviation 30° or more	More than 3 hours total per day	
		No other risk factors	More than 4 hours total per day	

Check (✓) here if this is a WMSD hazard

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Highly Repetitive Motion				
Body Part	Physical Risk Factor	Combined with	Duration	
Neck, shoulders, elbows, wrists, hands	Using the same motion with little or no variation every few seconds (excluding keying activities)	No other risk factors	More than 6 hours total per day	Check (✓) here if this is a WMSD hazard <input type="checkbox"/>
	Using the same motion with little or no variation every few seconds (excluding keying activities)	Wrists bent in flexion 30° or more, or in extension 45° or more, or in ulnar deviation 30° or more AND High, forceful exertions with the hand(s)	More than 2 hours total per day	<input type="checkbox"/>
	Intensive keying	Awkward posture, including wrists bent in flexion 30° or more, or in extension 45° or more, or in ulnar deviation 30° or more	More than 4 hours total per day	<input type="checkbox"/>
		No other risk factors	More than 7 hours total per day	<input type="checkbox"/>
Repeated Impact				
Body Part	Physical Risk Factor	Duration	Visual Aid	Check (✓) here if this is a WMSD hazard
Hands	Using the hand (heel/base of palm) as a hammer more than once per minute	More than 2 hours total per day		<input type="checkbox"/>

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Knees	Using the knee as a hammer more than once per minute	More than 2 hours total per day	



Heavy, Frequent or Awkward Lifting

This analysis only pertains if you have "caution zone jobs" where employees lift 10 lbs. or more

Step 1

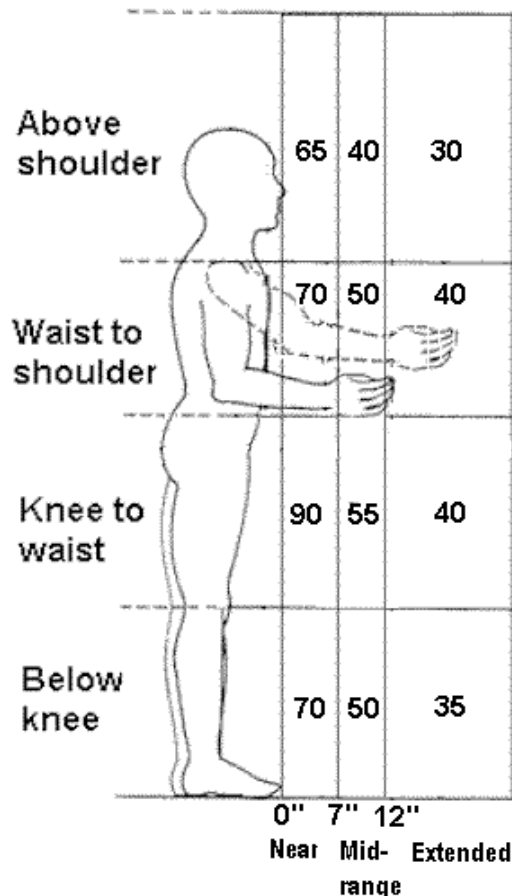
Find out the actual weight of objects that the employee lifts.
Actual Weight = _____ lbs.

Step 3

Find the Limit Reduction Modifier. Find out how many times the employee lifts per minute and the total number of hours per day spent lifting. Use this information to look up the Limit Reduction Modifier in the table below.

Step 2

Determine the Unadjusted Weight Limit. Where are the employee's hands when they begin to lift or lower the object? Mark that spot on the diagram below. The number in that box is the Unadjusted Weight Limit in pounds.



How many lifts per minute?	For how many hours per day?		
	1 hr or less	1 hr to 2 hrs	2 hrs or more
1 lift every 2-5 mins.	1.0	0.95	0.85
1 lift every min	0.95	0.9	0.75
2-3 lifts every min	0.9	0.85	0.65
4-5 lifts every min	0.85	0.7	0.45
6-7 lifts every min	0.75	0.5	0.25
8-9 lifts every min	0.6	0.35	0.15
10+ lifts every min	0.3	0.2	0.0

Note: For lifting done less than once every five minutes, use 1.0

Step 4

Limit Reduction Modifier: _____
Calculate the Weight Limit. Start by copying the Unadjusted Weight Limit from Step 2.

Unadjusted Weight Limit: = _____ lbs.

If the employee twists more than 45 degrees while lifting, reduce the Unadjusted Weight Limit by multiplying by 0.85. Otherwise, use the Unadjusted Weight Limit

Twisting Adjustment: = _____

Adjusted Weight Limit: = _____ lbs.

Multiply the Adjusted Weight Limit by the Limit Reduction Modifier from Step 3 to get the Weight Limit.

X

Limit Reduction Modifier: _____

Weight Limit: = _____ lbs.

Step 5

Is this a hazard? Compare the Weight Limit calculated in Step 4 with the Actual Weight lifted from Step 1. If the Actual Weight lifted is greater than the Weight Limit calculated, then the lifting is a WMSD hazard and must be reduced below the hazard level or to the degree technologically and economically feasible.

Unadjusted Weight Limit: _____ lbs.

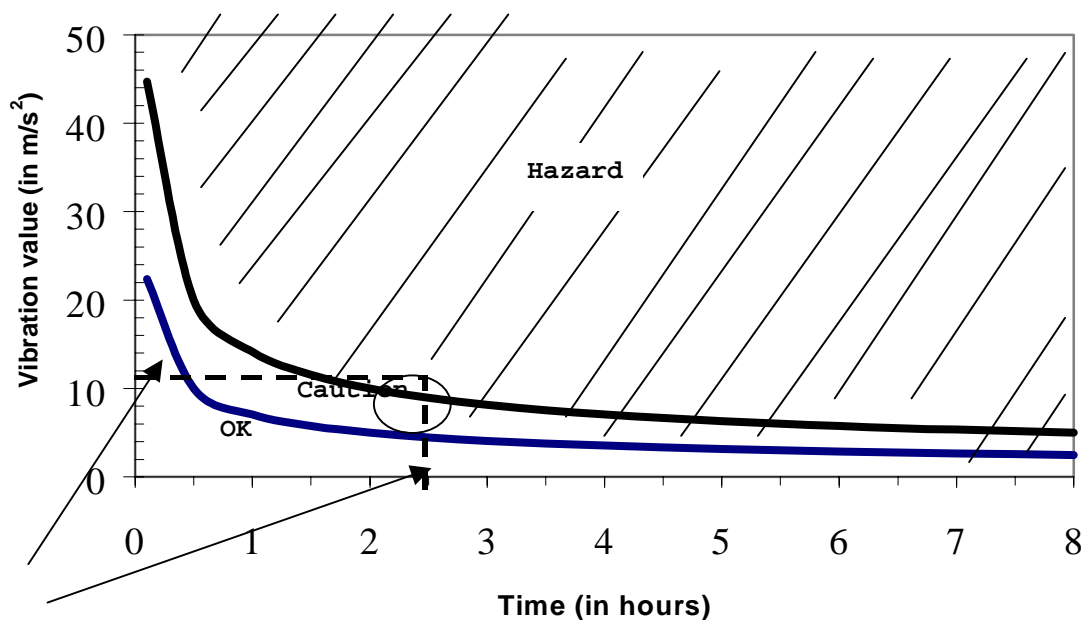
Note: If the job involves lifts of objects with a number of different weights and/or from a number of different locations, use Steps 1 through 5 above to:

1. Analyze the two worst case lifts -- the heaviest object lifted and the lift done in the most awkward posture.
2. Analyze the most commonly performed lift. In Step 3, use the frequency and duration for all of the lifting done in a typical workday.

Hand-Arm Vibration

Use the instructions below to determine if a hand-arm vibration hazard exists.

- Step 1. Find the vibration value for the tool. (Get it from the manufacturer, look it up at this web site: <http://umetech.niwl.se/vibration/HAVHome.html>, or you may measure the vibration yourself). The vibration value will be in units of meters per second squared (m/s^2). On the graph below find the point on the left side that is equal to the vibration value.
- Step 2. Find out how many total hours per day the employee is using the tool and find that point on the bottom of the graph.
- Step 3. Trace a line in from each of these two points until they cross.
- Step 4. If that point lies in the crosshatched "Hazard" area above the upper curve, then the vibration hazard must be reduced below the hazard level or to the degree technologically and economically feasible. If the point lies between the two curves in the "Caution" area, then the job remains as a "Caution Zone Job." If it falls in the "OK" area below the bottom curve, then no further steps are required.



Example:

An impact wrench with a vibration value of 12 m/s^2 is used for $2\frac{1}{2}$ hours total per day. The exposure level is in the Hazard area. The vibration must be reduced below the hazard level or to the degree technologically and economically feasible.

Note: The caution limit curve (bottom) is based on an 8-hour energy-equivalent frequency-weighted acceleration value of 2.5 m/s^2 . The hazard limit curve (top) is based on an 8-hour energy-equivalent frequency-weighted acceleration value of 5 m/s^2 .

Appendix 23-B

ERGONOMICS RESOURCES

Naval Facilities Engineering Command ergonomic support

Ergonomic Program Manager
SOUTHWESTNAVFACENGCOM
1220 Pacific Hwy
San Diego, CA 92132-5190
Ph: 619-532-2536, DSN: 522-2536
Fax: 619-532-1195

Bureau of Medicine and Surgery (BUMED) ergonomic support

Navy Environmental Health Center
620 John Paul Jones Circle
Suite 1100
Portsmouth, VA 23708-2103
Phone: (757) 462-5500
After Hours: (757) 621-1967
DSN: 253-5500

Contact: Industrial Hygiene or Occupational Medicine directorates

Chief of Naval Operations (N45) ergonomic resource

<http://www.navosh.net/ergonomics>

This web site contains ergonomic best practice examples, public domain documents, government documents, technical information, and links to other ergonomic sites. This site will also have information for the Job Requirements and Physical Demands Survey (JRPD) which is an ergonomic tool to enable Safety and Occupational Health professionals identify ergonomic risk factors and prioritize problem areas.

Appendix 23-C

Recommended Ergonomic Training

General orientation training for new employees

- (1) Ergonomic risk factors related to the employee's job.
- (2) Back injury prevention
- (3) Early symptoms and warning signs of WMSD. Reporting of signs and symptoms. The basic structures of the body, how they function together and how they are affected by WMSDs
- (4) Correct use of ordinary hand tools to include proper body position. Selection and use of ergonomically designed tools available in the workplace.
- (5) Workstation design and adjustment.

Personnel with back injury risk factors. Activities should provide initial back injury prevention training for personnel with jobs having identified risk factors for back injury. As a minimum, this training should include:

- (1) Basic anatomy and physiology of the spine and neck.
- (2) Warning signs of back injury.
- (3) Biomechanics of lifting and proper lifting techniques
- (4) Back injury risk factors on and off the job

Manager. Managers should receive sufficient training on ergonomic issues to effectively carry out their responsibilities for the health and safety of their employees.

- (1) Proper maintenance of facilities, equipment and tools as a technique to minimize ergonomic stress
- (2) The elements of an effective case management process
- (3) Safe and unsafe ergonomic behaviors of employees
- (4) Forming worker based teams and the benefits of a team approach to ergonomics.
- (5) Ergonomic policy of the Navy, Department of Defense, and the Occupational Safety and Health Administration (OSHA).

Supervisors. Supervisors with employees subject to identified ergonomic risk factors should receive the following training:

1. Recognition of WMSD signs and symptoms.
2. WMSD reporting.
3. Ergonomic risk factors, such as, awkward postures, static positions, external forces, repetitive motion and lifting hazards.
4. Methods to reduce or eliminate ergonomic risk factors.
5. How to obtain ergonomic assistance.

Collateral duty personnel. Activities without full time professional OSH managers may assign collateral duty personnel to administer an ergonomics program. At a minimum their training should include:

1. How to manage an ergonomics program
2. How to identify ergonomic hazards.
3. Measures to reduce or eliminate ergonomic hazards.
4. How to evaluate the effectiveness of ergonomics programs and controls.

Facility Engineers, Architects, and Designers. Engineering staffs responsible for planning, designing, or writing specifications for equipment, tools, jobs, tasks and processes should receive formal training on methods of eliminating or reducing ergonomic risk factors.

Appendix 23-D

Ergonomic Considerations for Shift Workers

A. Background

Shift work is a risk factor for several medical disorders, poor performance, and decreased vigilance in the job. It presents these problems because of its conflict with normal human biological rhythms, particularly the sleep/wake rhythm and the temperature rhythm, which direct the body to sleep at night.

The problem with night work and transmeridian jet travel is that normal time cues are shifted faster than the human circadian rhythm can adjust. For example, it takes at least 2 days for the sleep/wake cycle to adjust to a 6-hour transmeridian flight. More time is required for body temperature and performance rhythms to adjust. Two to 3 weeks are required for complete adjustment of the temperature rhythm to a complete day-night reversal (a 12-hour time shift). Because different biological rhythms adjust at different rates, not only does the person become desynchronized with respect to external time cues, but individual rhythms no longer have a normal phase relationship.

The most frequent problem for night workers, experienced by at least 60 percent of these workers, is chronic sleep deprivation due to not only fewer total hours of sleep, but disrupted sleep as well. Such sleep deprivation in night workers can be severe. Night work has also been shown to be disruptive with respect to family and social interactions. Shift-workers are at higher risk for psychosocial problems as well as family problems, including divorce.

Personnel with a history of rigid sleep requirements, strong "morning types," and older workers (over 45) are more apt to have difficulty adjusting to night work. Five to 20 percent of night workers will suffer from shift maladaptation syndrome, which can only be treated by removal from the night shift.

B. Shift Workers Scheduling Guidelines

Supervisors who prepare schedules for night shifts must consider the potential for scheduling practices to affect the ability of individuals to perform assigned tasks safely.

Unless prescribed by current labor contracts, schedules must be rotated in the forward (clockwise) direction. This direction is best because the human clock runs slow with respect to the 24-hour solar day and, therefore, adjusts faster to a phase delay than to a phase advance. The following additional guidelines regarding scheduling of night workers, including workers on rotating schedules that include night work, are recommended for consideration when preparing schedules.

- (1) At least 48 hours off should follow the night shift rotation.
- (2) Overtime should be avoided for personnel adjusting to time shifts.

C. Medical Surveillance for Shift Workers

Being assigned night shift work, by itself, does not obligate an employee to undergo a medical evaluation. Where medical evaluations are required, due to positions covered by medical standards, the requirement to work night shifts should be indicated by the appointing officer on the SF-78 by circling item B-28, "Protracted or irregular hours of work," to alert the examining physician to evaluate fitness to work night shifts or recommend appropriate restrictions.

Supervisors may request medical qualification information from workers who demonstrate persistent performance problems or increased absenteeism after beginning night work. Even workers who have been able to tolerate night work for years may begin to show signs and symptoms of shift work intolerance with increasing age.

Pre-employment evaluation of workers who will be involved in night work and surveillance of shift work employees require attention to the following medical conditions that may impair an individual's ability to perform assigned tasks safely or be aggravated by shift work schedules:

1. Diabetes mellitus, epilepsy, cardiovascular disease, asthma, peptic ulcer, irritable bowel syndrome, or use of medication with circadian variation in effectiveness. The examining physician must determine when such medical conditions are severe enough to warrant medical disqualification for night work.

2. Supervisors are cautioned to consult Federal Personnel Manual (FPM) chapter 339 governing medical qualification determinations.

D. Additional References.

1. LaDou J., Occupational and Environmental Medicine, 2nd ed., pp 592-3, Appleton and Lange, 1997.
2. Rom W.N., Environmental and Occupational Medicine, 3rd ed., pp 1173-7, Lippincott Williams and Wilkins, 1998.
3. Scott A.J., "Shift Work and Health", Primary Care, 1 Dec 2000, 1057-79.